

Zener diode can be controlled to a small extent.

[Third Modification]

Fig. 4 shows a third modification.

In this modification, unlike the first modification, a transistor 75 for driving an alarm lamp 89 in the driver's seat is provided so that the alarm lamp driving transistor 75 is controlled with an output signal of a timer circuit 67.

An ordinary failure alarm detecting circuit 73, lights up the alarm lamp 89, by detecting the well known failure mode. An OR gate 74, obtains the logical sum of the output signal of the timer circuit 67, and the output signal of ordinary failure detecting circuit 73.

Employing this structure, when occurrence of a failure in the power supply line 8 is detected, supply of the field current stops and the transistor 75 for driving the alarm lamp 89 is turned off to light up the alarm lamp 89, in order to notify occurrence of a failure to a driver. When power generation stops due to the generation of high voltage, the driver is immediately notified. Therefore, generation of a failure can be detected quickly and adequate measures can be taken before a failure extends to wider area.

If the power generation stop period is extended, battery voltage is gradually lowered and a low voltage alarm, which is one of the ordinary alarm mode is operated. Thereby, the driver can also be notified of a failure.

[Fourth Modification]

Fig. 5 shows a fourth modification.

In this modification, unlike the second modification, a binary pulse is generated from the output voltage of the armature winding 3 and a failure in the power supply line 8 is detected with a digital counter 76.

5 The second comparator 66 compares voltage of the power supply line 8 with the threshold value V_2 , which is larger than V_{reg} and smaller than the reverse breakdown voltage V_z of the Zener diode to generate a binary pulse signal. Setting is executed to generate high level voltage through the inversion when such a binary pulse is generated exceeding the predetermined number. Therefore, while the binary pulse is generated exceeding the predetermined number of pulses, the timer circuit 67 is started and power generation is stopped only for the predetermined period. With this control method, an operation effect that is similar to that in the second modification can be attained and damage to the power supply line 8, alternator 1 and electrical systems of the vehicle can be alleviated.

[Fifth Modification]

Fig. 6 shows a fifth modification.

20 In this modification, when a certain failure is detected in the power supply line 8, the reference value of the first comparator 65, namely the regulated voltage value is set as the second regulated voltage value V_{reg2} , that is smaller than the ordinary value V_{reg} . Owing to this setting, if a failure is detected, the amount of power generated can easily be reduced.

25 The second regulated voltage value is set, for example, to the value to maintain the minimum voltage to drive the voltage

regulator 6. Owing to this setting, the minimum power to realize re-generation of power after cease of operation of timer circuit can be reached and the alarm function to notify the alarm signal can also be maintained.

5 For example, the second regulated voltage value is preferably set to about one half of the nominal voltage of the on-board battery. In this modification, when the timer circuit is in the operative condition, that is, a failure is detected in the power supply line 8, an output current of only the field current flows into the full-wave rectifier 4, and therefore temperature rise of the rectifying diode can be kept to a very small value.

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20 In this modification, operation is set to a sequence wherein the operation mode immediately shifts to the power generation control mode or generation stop mode upon detection of a failure in the power supply line 8. It is also possible to introduce a sequence, wherein the failure detecting circuit shifts to the power generation control mode or stop mode when the period, wherein the peak value of the rectifier output or armature winding output exceeds the predetermined value, continues for the constant time or longer.

[Second Embodiment]

Fig. 8 shows an alternator 1 for a vehicle according to a second embodiment.

25 The alternator 1 for a vehicle comprises an armature winding 3, a full-wave rectifier 4, a field winding 5 and a voltage regulator 6. The full-wave rectifier 4 is formed of power Zener